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ABSTRACT

Findings of studies which looked at the effectiveness of the individualized instruction teaching approach are synthesized. After a search of several computer databases and of bibliographies of reports, the researchers located a total of 51 usable studies. Each of these was published after 1955, was relevant to grades 6 through 12, had both control and treatment groups, and suffered from no major methodological flaws. Study outcomes were examined in four different areas: student achievement as measured on final course examinations; student achievement on examinations in critical thinking; favorability of student attitudes toward subject matter of a course; and student self-concept. Instead of a simple descriptive review, a meta-analytic technique was used to synthesize the findings. In this meta-analysis the outcomes of the studies were described in a quantified form, the studies were coded according to their significant features, and the quantified outcomes were related to the significant features of the studies. Results showed that individualized systems of secondary school teaching have not met the great hopes they once raised. Of the 49 studies reporting final exam scores, only 12 showed statistically significant differences due to teaching method and 4 of these were in favor of conventional teaching. Results for critical thinking, self-concept, and student attitudes were similarly negative. (RM)

Individualized Systems of Instruction:

A Meta-Analysis of Findings in Secondary Schools

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Abstract

This meta-analytic synthesis of findings from 51 studies conducted in secondary education during the last 25 years indicates that individualized systems of instruction produce positive but trivially small increases in student achievement when compared to conventional instruction. This result is consistent across a variety of academic settings and research designs and holds true for both published and unpublished studies. In addition, individualized systems do not contribute significantly to student self-esteem, critical thinking ability, or attitudes toward the subject matter being taught. These meta-analytic results are consistent with those from most earlier narrative reviews.

Much has been said about individualized instruction over the last decade. During the 1970's, for example, the Educational Index listed more than 100 articles each year on this topic. In spite of all that has been said, however, little is known of the effectiveness of this approach, especially at the secondary school level. The results of independent studies are often contradictory, at times attributing significant gains in student achievement to individualization, and at other times reporting no difference in results from traditional and individual instruction. Since differences among studies are unavoidable in important features such as experimental method, student aptitude, and instructional design, replication of findings is impossible. Educational researchers have to turn to more encompassing reviews of these independent findings to develop a more coherent picture.

Three reviews of individualized instruction at the secondary level were produced in 1976 (Hirsch, 1976; Miller, 1976; Schoen, 1976). The three reviews were in agreement that individualized instruction was not effective as measured by results on final examination. Only one-fourth of their studies yielded significant results; one-third of these significant findings favored conventional classroom instruction. These reviews, however, were lacking in three ways: first, they focused only on instruction in the area of mathematics; second, they were not able to quantify the degree of the difference between individual and conventional instruction; and third, they made no effort to relate features of the studies to outcomes.

Two additional reviews have presented findings that differ from those of the 1976 studies. In one, Block and Burns reviewed and quantified the effects of mastery learning. They found an increase of effectiveness over conventional instruction of about .8 standard deviations at all grade levels. This is equivalent to an increase in performance from the 50th percentile to the 79th, which is a substantial increase. The second review, performed by Susan Hartley in her dissertation at the University of Colorado, quantified the outcomes of secondary school studies which examined the effects of individualization. The content area for these studies was only mathematics. Her analysis found that, on the average, high school students showed increases from the 50th to the 66th percentile. The results of these two reviews are obviously not consistent with the earlier, more negative reviews.

We at The University of Michigan had two goals in our review of individualized instruction. First, we wished to resolve the inconsistencies that remained from the earlier investigations. Secondly, we planned to compensate for the limitations of the earlier studies. That is, we included

studies from content areas other than just mathematics; we quantified the difference in effectiveness between traditional and individual instruction; and we examined the relationships between study features and outcomes.

To make these necessary improvements, we had to use a method that is different from the simple descriptive review. We used meta-analytic techniques. Meta-analysis is a four step process. First, usable studies are located. Secondly, the outcomes of the studies are described in a quantified form. Third, these studies are coded according to their significant features. Finally, quantified outcomes are related to the significant features of these studies.

At the outset of our review, we established criteria for the inclusion of studies. We observed that the term "individualized instruction" is used most often to refer to total systems of instruction. Examples of these systems are Individually Prescribed Instruction or IPI, Program for Learning in Accordance with Needs or PLAN, and Keller's Personalized System of Instruction or PSI. In these systems, material to be covered is first divided into units, often equivalent in length to a chapter in a textbook. Printed study guides, which state unit objectives and suggest study procedures, are prepared to direct work on each unit. Students work on the units at their own rate, but before moving from one unit to the next, each student must demonstrate mastery of the first unit by perfect or near-perfect performance on formative tests. Students are not penalized for failing to pass a first, second, or later form of a test, but they must demonstrate mastery before moving on. Studies of instruction designed in this way were included in our analysis.

After a thorough search of several computer databases and of the bibliographies of promising reports, we located a total of 51 usable studies. Each of these was published after 1955, was relevant to grades 6 through 12, had both a control and a treatment group, and suffered from no major methodological flaws.

We examined study outcomes in four different areas: student achievement as measured on final course examinations, student achievement on examinations in critical thinking, favorability of student attitudes toward subject matter of a course, and favorability of student self-concept. To quantify the effects of individualized systems in each of these areas, we used the Effect Size or ES. The effect size describes the difference between the means of experimental and control groups in terms of the standard deviation of the control group.

The 51 studies were of many different types. To describe their main features, we defined a set of 13 variables and coded each study accordingly. Four of the variables described the types of individualized systems used in the studies; two described experimental designs of the studies; four described study settings; and two described publication features.

Our results show that individualized systems of secondary school teaching have not met the great hopes they once raised. Of the 49 studies reporting final exam scores, only 12 showed statistically significant differences due to teaching method and 4 of these studies were in favor of conventional teaching. These findings are consistent with the earlier 1976 reviews. In quantitative terms, the average difference between traditional and individualized secondary school instruction is one-tenth of a standard deviation, which is equivalent to an increase in performance from the 50th to the 54th percentile. Clearly, this is a trivial effect.

Secondly, we found that differences in study features, experimental design, or variations in individualization had no significant relationship to performance on final exams.

Our results for critical thinking, self-concept, and student attitudes were similarly negative. Four studies were found reporting critical thinking data and four reporting self-concept data. The effect size for each was one-fourth of a standard deviation, a small effect.

Fourteen studies reported results on students' attitudes toward the subject matter they were being taught. Two of the 14 studies had significant results, both favoring individualization. The average effect size was .14 standard deviations, a very small effect.

The findings of this meta-analytic review were consistent with the results of most earlier descriptive reviews. The results of Hartley's dissertation, however, were more positive than those found here. Examining the studies that Hartley collected, we found that three suffered serious methodological flaws. Since Hartley's procedure was to calculate several effect sizes from a single study and since she used only nine studies to represent individualized instruction in secondary schools, it is possible that the three flawed studies contributed results which inflated her averaged findings. These studies were not included in our analysis.

Our findings also differed strikingly from those reported by Block and Burns in their review of mastery learning. These reviewers, however, based their conclusions on a type of study that differed substantially from the type

covered in our analysis. In the studies cited by Block and Burns, both experimental and control groups learned from self-instructional materials. The lack of groups taught in a conventional manner disqualified Block and Burns's studies from use in our analysis.

In summary, then, individualized systems of secondary instruction produce only negligible gains in final exam performance, critical thinking, self-concept, and attitude toward subject. These gains are consistently small regardless of methodological, ecological, or instructional features. Of the many educational innovations taking place in the secondary schools, individualized systems should not be expected to produce significant gains in student performance and attitude.

References

Block, J. H., & Burns, R. E. Mastery learning. In L. S. Shulman (Ed.). Review of research in education (Vol. 4). Itasca, ILL: F. E. Peacock, 1976.

Bloom, B. S. Human characteristics and school learning. New York: McGraw-Hill, 1976.

Hartley, S. S. Meta-analysis of the effects of individually paced instruction in mathematics. (Doctoral dissertation, University of Colorado, 1977). Dissertation Abstracts International, 1978, 38(7-A), 4003. (University Microfilms No. 77-29926)

Hirsch, C. R. A review of research on individualized instruction in secondary mathematics. School Science and Mathematics, 1976, 76, 499-507.

Miller, R. L. Individualized instruction in mathematics: A review of research. Mathematics Teacher, 1976, 69, 345-351.

Schoen, H. L. Self-paced instruction: How effective has it been in secondary and post-secondary schools. The Mathematics Teacher, 1976, 69, 352-357.

Footnote

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